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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/076,420	02/19/2002	Hiroyuki Nakagawa	1021.41200X00	9292

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EXAMINER

BERNATZ, KEVIN M

ART UNIT	PAPER NUMBER
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1773

DATE MAILED: 04/24/2003

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/076,420

Applicant(s)

NAKAGAWA ET AL.

Examiner

Kevin M Bernatz

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☒ Claim(s) 6 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Objections

1. Claim 6 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 1 already requires that the second layer is formed of Co and Cr (the Examiner notes that claim 6 does not restrict the second layer to *consisting of* Co and Cr).

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1 – 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimizu et al. (U.S. Patent App. No. 2003/0059651 A1) in view of Sakai et al. (U.S. Patent App. No. 2002/0018917 A1).

Regarding claims 1, 6 and 8, Shimizu et al. disclose a perpendicular magnetic recording medium (*Paragraph 0088*) comprising a soft magnetic undercoat layer (i.e. applicant's "magnetic layer") (*Figure 1, element 2*) formed above a substrate (*element 1*), wherein said magnetic layer contains Co and Cr as a main component (*Paragraph*

0049 – “CoCrZr”). Regarding claim 8, the limitations “a magnetic recording head” and a “signal reproduction head” are nominal apparatus limitations present in MR read/write heads (*Shimizu et al.*, *Figure 10A and Paragraphs 0163 – 0165 and pertinent prior art cited below – Maeda et al.*).

Shimizu et al. fail to disclose a first layer formed on an opposite side of the magnetic layer relative to the substrate, said first layer including an amorphous alloy layer containing rare-earth metals and 3d transition metals as a main component, and a second layer formed on said first layer, said second layer containing Co and Cr.

However, Sakai et al. teach a perpendicular recording medium wherein the perpendicular magnetic layer (*i.e. Shimizu et al.’s layer 5*) comprises a first layer including an amorphous alloy layer containing rare-earth metals and 3d transition metals (*i.e. a RE-TM alloy*) as a main component, and a second layer formed on said first layer, said second layer containing Co and Cr (*Paragraphs 0042 – 0045*) in order to suppress the formation of grain boundaries to provide increased recording density, lower noise and increased durability (*Paragraphs 0008 and 0018*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant’s invention to modify the device of Shimizu et al. to utilize a perpendicular magnetic layer comprising a first and second layer meeting applicant’s claimed limitations as taught by Sakai et al. in order to suppress the formation of grain boundaries to provide increased recording density, lower noise and increased durability.

Regarding claims 2 and 3, Shimizu et al. disclose an intermediate layer (*i.e. applicant’s “other alloy film containing Co and Cr”*) (*Figure 1, element 4 and Paragraph*

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0084) located below the perpendicular magnetic layer comprising the first and second layers taught by Sakai et al. above. The Examiner deems that the combined Shimizu et al. intermediate layer and Sakai et al. RE-TM "first layer" reads on applicant's claimed limitations since they are adjacent and are therefor a "multilayer film".

Regarding claims 4 and 7, the thickness of each magnetic layer is a cause effective variable in terms of the tBr values and other magnetic properties (*Sakai et al., Paragraphs 0048 and 0052; and Shimizu et al., Paragraphs 0094 – 0096 and Tables*). It would, therefore, have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable such as the thickness of the "first" and "second" layer through routine experimentation. *In re Boesch*, 205 USPQ 215 (CCPA 1980), *In re Woodruff*, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Regarding claim 5, Sakai et al. disclose RE-TM alloys meeting applicant's claimed limitations (*Paragraph 0045*).

4. Claims 1 – 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakai et al. ('917 A1) in view of Chen et al. (U.S. Patent No. 5,763,071).

Regarding claims 1, 6 and 8, Sakai et al. disclose a perpendicular magnetic recording medium (*Title*) comprising a first layer (i.e. applicant's "magnetic layer") (*Figure 1 – element 4*) formed above a substrate (*element 1*), said "magnetic layer" containing Co and Cr as a main component, a second layer (i.e. applicant's "first layer") formed on an opposite side of the magnetic layer relative to the substrate, said "first layer" including an amorphous alloy layer containing rare-earth metals and 3d transition

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metals as a main component (*Paragraphs 0041 – 0045 – wherein Sakai et al. teach an embodiment comprising “a two layered magnetic layer” wherein the “first layer is a magnetic layer of a CoCr alloy ... and the second layer is a magnetic layer of a rare-earth-transition metal alloy amorphous film”*). Regarding claim 8, the limitations “a magnetic recording head” and a “signal reproduction head” are nominal apparatus limitations present in MR read/write heads (*see pertinent prior art cited below – Maeda et al.*).

Sakai et al. fail to disclose a “second” layer containing Co and Cr above the “first layer”, though Sakai et al. does explicitly teach that the medium is not limited to just 2 layers, but “a magnetic layer of two or more layers” wherein “at least one layer of the magnetic layer with two or more layers is a magnetic layer of a rare earth-transition metal alloy amorphous film” (*Paragraph 0043*).

However, Chen et al. teach that it is known in the art to form magnetic recording media (longitudinal media, in the Chen et al. invention) by forming multiple magnetic layers sequentially deposited one upon another (*Figures 2 – 4 and col. 6, lines 5 – 8 and lines 46 – 48*) in order to increase the areal recording density (*col. 1, lines 51 – 53*).

Given that Sakai et al. explicitly teach that the magnetic layer can comprise more than 2 magnetic layers, it would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Sakai et al. to include a stacked structure comprising alternating CoCr magnetic layers and RE-TM amorphous magnetic layers (thereby meeting applicants' claimed limitations) as taught by Chen et al. to increase the areal recording density.

Regarding claims 2 and 3, the examiner notes that the embodiments comprising {CoCr magnetic/RE-TM magnetic}_n, where n is 3 or higher would meet applicants' claimed limitations and Chen et al. explicitly teach embodiments where n = 2 and n = 3 (i.e. a structure of: CoCr/RE-TM/CoCr/RE-TM/CoCr/RE-TM would result given the combined teachings, with or without non-magnetic intermediate layers).

Regarding claims 4 and 7, the thickness of each magnetic layer is a cause effective variable in terms of the Mrt values and other magnetic properties (*Sakai et al., Paragraphs 0048 and 0052; and Chen et al., col. 4, lines 38 – 47; Figures and Tables*). It would, therefore, have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable such as the thickness of the "first" and "second" layer through routine experimentation.

Regarding claim 5, Sakai et al. disclose RE-TM alloys meeting applicant's claimed limitations (*Paragraph 0045*).

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Maeda et al. (U.S. Patent App. No. 2002/0150793 A1) disclose a perpendicular recording medium comprising CoCr alloy layers and RE-TM alloy layers, as well as the nominal apparatus limitations claimed in claim 8 (*Figures 9 and 10, and Paragraphs 0049 and 0092*), though Maeda et al. fail to disclose a structure meeting applicants' claimed structure (*Figure 1 and Paragraph 0053*). Igarashi et al. (U.S. Patent App. No. 2002/0132140 A1) disclose a longitudinal medium (*Figure 3*) wherein

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multiple layers can comprise a CoCr alloy/RE-TM alloy/CoCr alloy (*Paragraphs 0036 – 0038*). Kikitsu et al. (U.S. Patent App. No. 2001/0051287 A1) teach thermally-assisted magnetic recording media comprising CoCr alloys used in combination with RE-TM alloys, but fails to teach a perpendicular recording media comprising the structure claimed by applicant (*see Examples and underlined/boxed sections*). Sawamura et al. (U.S. Patent No. 6,500,530) teach using RE-TM alloys for perpendicular magnetic recording (*entire disclosure*). Shimizu et al. (U.S. Patent App. No. 2002/0012816 A1) teach a multilayered perpendicular recording media wherein the lower magnetic film may be an amorphous RE-TM alloy and the upper films are CoCr alloys (*Example 1 – TbFeCo/CoCrPt/CoCrPt*). Gambino et al. (IEEE Trans. Mag., 25(5), 1989, 3749 – 3751) teach MO storage media comprising CoPd/TbCo/CoPd lattice structures, but fails to teach using these structures for perpendicular magnetic (i.e. non-MO) applications, nor using a CoCr alloy instead of just CoPd (*underlined sections*).


6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin M Bernatz whose telephone number is (703) 308-1737. The examiner can normally be reached on M-F, 9:00 AM - 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Thibodeau can be reached on (703) 308-2367. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0651.



KMB
April 18, 2003



Paul Thibodeau
Supervisory Patent Examiner
Technology Center 1700